PCT/GB 00/01968

31 MAY 2000

INVESTOR IN PEOPLE

GB00/1968

PRIORITY DOCUMENT

SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

4

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed

Dated 22 June 2000

Patents Form 1/77

Patents Act 1977
(Rule 16)

The Patent Office

29OCT99 E487650-1 C03066
P01/7700 0.00 - 9925498.9

1/77

THE PATENT OFFICE
K
29 OCT 1999
RECEIVED BY POST

01 JUN 1999

Request for grant of a patent

(see the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road, Newport
South Wales NP9 1RH

1.	Your reference	RMV/P95428
2.	Patent application number *(The Patent Office will fill in this part)*	**9925498.9**
3.	Full name, address and postcode of the or of each applicant *(underline all surnames)* Patents ADP number *(if you know it)* If the applicant is a corporate body, give the country/state of its incorporation	JOHN ALEXANDER GASKARTH LOW RIGG STAINSACRE WHITBY NORTH YORKSHIRE YO22 4LP 7671365001
4.	Title of the invention	MATERIAL FOR USE IN FLUID TRANSFER SYSTEM
5.	Name of your agent *(if you have one)* "Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode) Patents ADP number *(if you know it)*	URQUHART-DYKES & LORD ST NICHOLAS CHAMBERS AMEN CORNER NEWCASTLE UPON TYNE NE1 1PE 00001644019

6.	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number	Country	Priority application number *(If you know it)*	Date of filing *(day/month year)*
		GB UNITED KINGDOM	9912652.6	01-JUNE-99

7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing *(day/month/year)*

8. Is a statement of inventorship and or right to grant of a patent required in support of this request? *(Answer "Yes" if:)*
a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body;
see note (d)

Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	9
Claim(s)	4
Abstract	1
Drawing(s)	1 + 1

10 If you are also filing any of the following items state how many against each item:

Priority documents	
Translation of priority documents	
Statement of inventorship and right to grant of a patent *(patents form 7/77)*	
Request for preliminary examination and search *(patents form 9/77)*	1
Request for substantive examination *(patents form 10/77)*	
Any other documents *(please specify)*	

11 I/We request the grant of a patent on the basis of this application.

Signature Date 26/10/99

URQUHART-DYKES & LORD

12 Name and daytime telephone number of person to contact in the United Kingdom: Martin Vinsome - 0191 2618573

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patent Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) if you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.

b) Write your answers in capital letters using black ink or you may type them.

c) If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.

d) If you have answered "Yes" Patents Form 7/77 will need to be filed

e) Once you have filled in the form you must remember to sign and date it.

f) For details of the fee and ways to pay please contact the Patent Office.

MATERIAL FOR USE IN FLUID TRANSFER SYSTEM

The present invention relates to a material for use in a system for transferring fluid, and to a fluid transfer system incorporating such a material. The invention relates particularly, but not exclusively, to a material for use in a drainage and/or irrigation system.

Underground drainage/irrigation systems are known in which an underground pipe having slits, respectively carries water away from/to an area of ground to be drained or irrigated. Such systems suffer from the drawback that mud and silt can enter into the pipe and cause blockages, or the slits in the pipe can become blocked by debris.

When laying such a pipe considerable care is required in maintaining a constant gradient to allow the water to pass in or out. Therefore obstacles in the ground, such as rocks or tree roots, have to be avoided and the back filling of trenches dug to lay the pipes in must be undertaken with great care.

Care when back filling is also required as such pipes can become distorted, compressed or ruptured. This can lead to direct blockage, or to inconsistent drainage or irrigation and an increased likelihood of blockage occurring due to siltation as described above.

Such pipe systems cannot be located close to trees or hedges as the roots of such plants can infiltrate the pipes. Once within

a pipe, the root system grows rapidly in the water rich environment and can quickly lead to blockages.

A further problem associated with pipe systems is that as the diameter of a pipe is increased, the quantity of material required to construct a pipe of sufficient strength to protect against compression dramatically increases. This in turn significantly increases the cost of the pipe.

All such pipes can also succumb to compression forces from the surface, such as experienced from increasing heavy farm machinery, and are prone to collapse. This problem is accentuated around areas of most frequent use, such as gateways.

Preferred embodiments of the present invention seek to overcome the above disadvantages of the prior art.

According to an aspect of the present invention, there is provided a material for fluid transfer for use in a system for transferring fluid, the material comprising:

at least one rubber material; and/or

at least one fibrous material; and

at least one thermoplastic material bonded thereto.

By providing a thermoplastic material bonded to at least one fibrous material and/or at least one rubber material, this provides the advantage of providing a material through which fluid can pass, but which prevents passage of larger particles such as stones or gravel, which could otherwise cause blockages in pipes.

At the same time, the material can be constructed with a relatively rigid open structure, which enables the material to be sufficiently strong and durable while still allowing fluid to pass therethrough. The rubber material is used to provide rigidity, and resilience to compressive forces. The fibrous material is provided to assist the rubber material in creating an open structure. In time the fibrous material may decay and further assist in creating an open structure.

At least one said rubber material may be chopped, shredded or comprises rubber crumb.

This provides the advantage of enabling the material to be formed into a large diameter, relatively solid, porous structure. By forming the material into a structure of large surface area in this way, the further advantage is provided of enabling the fluid flow through the material to be maximised, while at the same time enabling solid contaminants to be filtered. Furthermore, to create an increase in the overall size of the fluid transfer structure, without a decrease in strength of the structure, the above described embodiment of the present invention does not require an increase in material used in its construction, equivalent to that required in pipe systems.

In a preferred embodiment, at least one said rubber material may be recycled from tyres.

At least one said fibrous material may comprise straw.

At least one said fibrous material may comprise wood.

At least one said fibrous material may be inorganic.

At least one said thermoplastic material may be recycled.

The use of the above waste or recycled materials provides the advantage of utilising low cost raw materials, while at the same time providing a use for many materials which present difficulties in recycling. The rubber material used may be reclaimed from car tyres which at present are costly to dispose of. Fibrous materials such as straw also present disposal problems, in particular linseed and rape straw which rot much more slowly than other straws. The thermoplastics may also be recycled, and mixed source thermoplastics may be used. The use of mixed source thermoplastics has the further advantage that unlike many conventional thermoplastic recycling techniques, which require a relatively high level of purity of recycled material, almost any thermoplastic can be added to the mixture to provide the bonding of the other materials.

These benefits of low cost raw materials provide the further advantage that the volume of the material to be used is not restricted by cost, thus enabling drainage to be carried out on heavy, wet land.

At least one said thermoplastic material may be chopped or shredded.

In a preferred embodiment, the material is moulded.

Alternatively, the material may be formed by an extrusion process at elevated temperature.

In a preferred embodiment the material is at least partially surrounded by netting

Preferably, the netting is in the form of a fine mesh.

By providing a net around te material, the advantage is provided that an additional filtering of particulate matter

occurs prior to fluid passing into the material. This will therefore reduce the quantity of suspended solids within the effluent discharged from the material, making the effluent more suitable for discharging in watercourses or for providing drinking water for livestock. Furthermore the netting will reduce the risk of blockage within the material and therefore extend its life.

According to another aspect of the present invention, there is provided a system for transferring fluid comprising:

a conduit for carrying fluid; and

a material as defined above, the material cooperating with said conduit for transferring fluid thereto and/or therefrom.

In a preferred embodiment, said conduit is a gutter arranged in use below an elongate length of said fluid transfer material.

The conduit may be an elongate pipe having means for enabling passage of fluid between the interior and exterior thereof, said pipe being at least partially surrounded by an elongate length of said material.

The means for enabling passage of fluid between the interior and exterior of the pipe may comprise one or more apertures in the pipe.

The pipe may have at least one slot arranged in an upper part thereof in use.

The pipe may be porous.

Such a system may be used as an alternative or supplementary to back filling of trenches dug to lay drainage/irrigation pipes

in. Such a system has the advantage of protecting the pip from compressive forces. The system can also filter an minimise the passage of solid contaminants in drainage water before they can be introduced to the pipe.

The system may be for drainage.

Alternatively, or in addition, the system may be for irrigation.

According to a further aspect of the present invention, there is provided a material for fluid transfer for use in a system for transferring fluid, the material comprising:

at least one rubber material; and/or

at least one fibrous material; and

at least one bonding material bonded thereto.

At least one said bonding material may be a thermoplastic material.

At least one said bonding material may be an adhesive.

Preferred embodiments of the invention will now be described, by way of example only, and not in any limitative sense, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic perspective view of a cross-section view of a drainage and/or irrigation system of a first embodiment of the present invention;

Figure 2 is a view, corresponding to Figure 1, of a system of a second embodiment of the invention;

Figure 3 is a view, corresponding to Figure 1, of a system of a third embodiment of the invention; and

Figure 4 is a view, corresponding to Figure 1, of a system of a fourth embodiment of the invention.

Referring to Figure 1, an irrigation and/or drainage system 1 comprises a generally cylindrical pipe 2 having slots (not shown), the pipe 2 being surrounded by an elongate length of a fluid transfer material 3 formed from a moulded mixture of shredded thermoplastics, shredded rubber and organic and/or inorganic fibre. As can be seen form the Figure, the width of the length of material 3 is considerable greater in the region above the pipe 2 than in the vicinity of the pipe 2. This enables the material 3 to capture fluid from (or deliver fluid to) a large volume of ground.

Figure 2 shows a second embodiment of the irrigation and/or drainage system 11, which differs from the embodiment of Figure 1 in that the material 13 is of generally circular transverse cross section with the pipe 12 arranged at a lower part thereof.

Referring to Figure 3, a drainage and/or irrigation system 31 of a third embodiment comprises an elongate gutter 32 arranged below an elongate length of the fluid transfer material 33 described with reference to Figures 1 and 2 above and having the same shape as the material 3 of Figure 1. Similarly, the material 43 of the embodiment of Figure 4 has the same shape as the material 13 of figure 2.

Any of the above described embodiments of the present invention may be produced by moulding. A combination of the thermoplastics and at least one of the fibrous and rubber materials are heated to a temperature above the melt point of

the dominant thermoplastic of the mixture, and mixed before being placed in a mould and allowed to cool and set. The cooling process can be speeded by the introduction of liquid nitrogen. Ultrasonic heating techniques may be used to reach the required melt point temperature.

The above described embodiments can also be produced by extrusion. Hopper fed, straight barrel, straight screw, in-line or cross-head extruders are suitable systems for producing such materials. The speed of production and pressure used within the extruder can be varied to produce various densities (ie more open or compact structure) of products for use in different circumstances and purposes. Again liquid nitrogen can be used to assist in the cooling process, and ultrasonic heating techniques may be used to heat the mixture to the required temperature for extrusion. The use of adhesives in addition or as an alternative to thermoplastics would reduce or eliminate the necessity for heating the mixture and cooling the resultant product.

Use of an extrusion process will also tend to cause a proportion of the longer fibres, whether from the fibrous material or shreds of rubber, to align along the axis of the extrusion. When the extruded product is in the ground acting as drain or irrigation means, the direction of the fibres will tend to draw water along the drainage/irrigation system by a wicking process.

Where a cross-head extruder is used a line or rope may be introduced to the middle of the product profile. Netting may also be wrapped around the outside of the product to assist in the handling of the product once manufactured. The netting may be wrapped around the outside of the product either completely or at least partially covering it. Alternatively a sleeve of netting maybe introduced.

To form elongate gutter 32, shown in Figure 3, a sheet of thermoplastic is placed on the underside of the formed profile before it is cooled. The retained heat in the newly formed profile is sufficient to bond the thermoplastic to the profile. If there is not enough residual heat, addition heat can applied to assist with the bonding process.

It will be appreciated by persons skilled in the art that the above embodiments have been described by way of example only and not in any limitative sense, and that various alterations and modifications are possible without departure from the scope of the invention as defined by the appended claims. For example it will be appreciated by persons skilled in the art that fluid transfer systems with a high fibrous content (and low or zero rubber content) are suitable for use as absorbent materials for substances such as oils, and can therefore be formed into oil absorbent booms for spillage control.

It will also be appreciated by persons skilled in the art that such fluid transfer systems can be used as a rooting media for plants grown by hydroponic means.

It will be further appreciated that such fluid transfer systems can be formed into mats for laying under areas requiring intensive drainage and/or irrigation such as sports area including golfing greens. In another application for such a fluid transfer material a high rubber and low or zero fibrous content material can be formed into mats and used as part of a drainage system in the construction of roads.

CLAIMS

1. A material for fluid transfer for use in a fluid transfer system, the material comprising:

at least one rubber material; and/or

at least one fibrous material; and

at least one thermoplastic material bonded thereto.

2. A material according to claim 1, wherein at least one said rubber material is chopped, shredded or comprises rubber crumb.

3. A material according to claim 1 or 2, wherein at least one said rubber material may comprise material from recycled from tyres.

4. A material according to any one of the preceding claims, wherein at least one said fibrous material comprises straw.

5. A material according to any one of the preceding claims, wherein at least one said fibrous material comprises waste wood.

6. A material according to any one of the preceding claims, wherein at least one said fibrous material is inorganic.

7. A material according to any of one of the preceding claims, wherein at least one said thermoplastic material is recycled.

8. A material according to any of the preceding claims, wherein at least one said thermoplastic material is shredded.

9. A material according to any one of the preceding claims, wherein said material is formed by a moulding process.

10. A material according to any of claims 1 to 8, wherein said material is formed by an extrusion process.

11. A material according to any one of the preceding claims wherein said material is at least partially surrounded by netting.

12. A material according to claim 11 wherein said netting comprises a fine net mesh.

13. A material for use in a fluid transfer system, the material substantially as hereinbefore described with reference to the accompanying drawings.

14. A fluid transfer system comprising:

a conduit for carrying fluid; and

a material according to any of the preceding claims, the material cooperating with said conduit for transferring fluid thereto and/or therefrom.

15. A fluid transfer system according to claim 14 wherein said conduit is a gutter arranged in use below an elongate length of said material.

16. A fluid transfer system according to claim 14 wherein said conduit is an elongate pipe having means for

enabling passage of fluid between the interior and exterior thereof and said pipe being at least partially surrounded by an elongate length of said material.

17. A fluid transfer system according to claim 16 wherein said means for enabling the passage of fluid between the interior and the exterior of the pipe comprises one or more apertures in the pipe.

18. A fluid transfer system according to claim 16 wherein said means for enabling the passage of fluid between the interior and the exterior of the pipe comprises at least one slot arranged in the upper part of said pipe in use.

19. A fluid transfer system according to claim 16 wherein said pipe is porous.

20. A fluid transfer system according to any one of claims 14 to 19 wherein said system is used for drainage.

21. A fluid transfer system according to any one of claims 14 to 20 wherein said system is used for irrigation.

22. A fluid transfer system substantially as hereinbefore described with reference to the accompanying drawings.

23. A material for fluid transfer for use in a fluid transfer system, the material comprising:

at least one rubber material; and/or

at least one fibrous material; and

at least one bonding material bonded thereto.

24. A material according to claim 23, wherein at least one said bonding material comprises a thermoplastic material.

25. A material according to either claim 23 or claim 24, wherein at least one said bonding material comprises an adhesive.

ABSTRACT

MATERIAL FOR USE IN FLUID TRANSFER SYSTEM

A material for use in a fluid transfer system is disclosed. The material comprises one or more rubber materials, and/or one or more fibrous materials, and one or more thermoplastic or adhesive materials bonded thereto. The material is used in conjunction with pipes or gutters to produce systems for fluid transfer, in particular systems for drainage and/or irrigation.

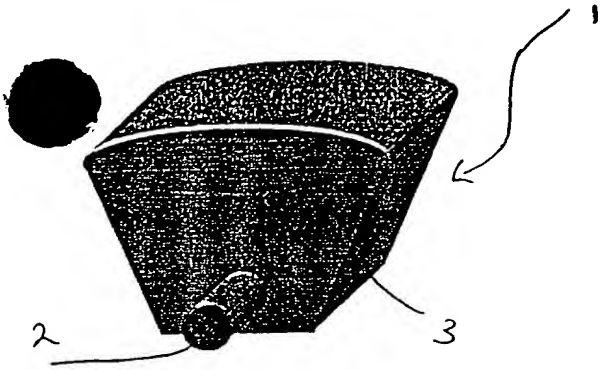

FIGURE 1

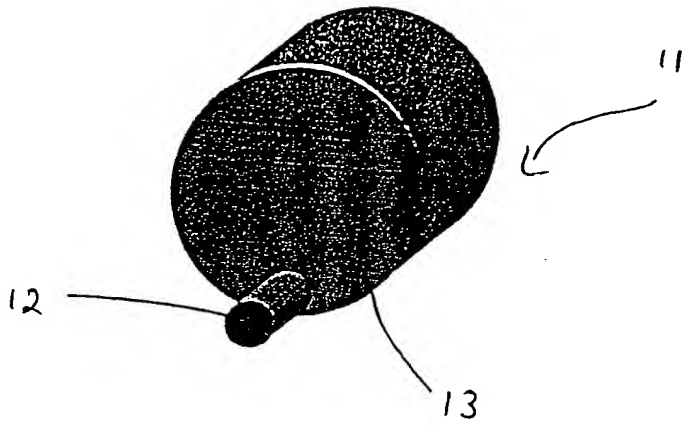

FIGURE 2

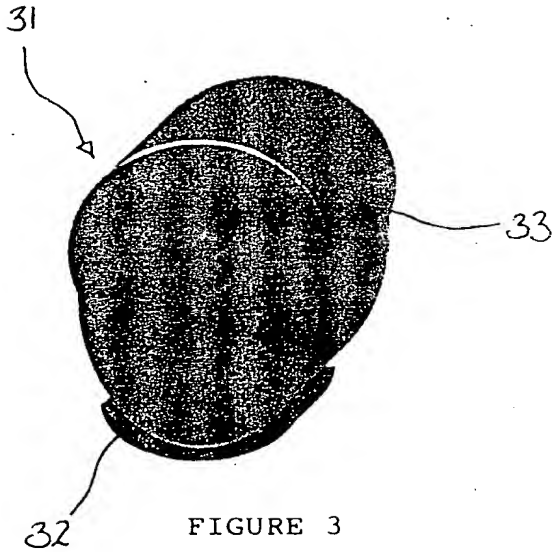

FIGURE 3

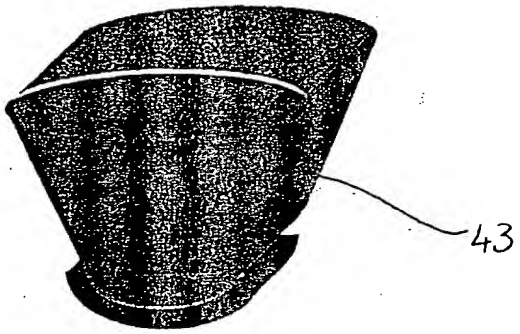

FIGURE 4

PCT/GB00/01968

19-6-00

Urquhart - Dykes & Lord